Journal of the Kansas Entomological Society

Volume 19 January, 1946 Number 1

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JAMES WALKER McCOLLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at Manhattan, Kansas, under the Act of August 24, 1912.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

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Subscriptions in the U.S.A.,	**$2.00 per year**	**Single Copy**
Canadian or foreign subscriptions,	**2.25 per year**	**75 cents**

KANSAS ENTOMOLOGICAL SOCIETY

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Vol. 19, No. 1, January, 1946

This issue mailed March 15

Kansas Entomological Society

Volume 19 January, 1946 Number 1

THE GENUS STENOCRANUS IN AMERICA NORTH OF MEXICO

(Homoptera-Fulgoridae-Delphacinae)

R. H. BEAMER*

The genus **Stenocranus** Fieber, as listed for this region by Z. P. Metcalf (General Cat. of Hemip., Fasc. IV, Fulgoroidea, Pt. 3, Araeopidae), contains the following species: **arundineus** Metcalf, **dorsalis** Fitch, **felti** Van D., **lautus** Van D., **luteivitta** Walker, **similis** Crawford and **unipunctatus** Prov. All of the above, as well as five new species, are included in this paper except **luteivitta** Walker which, judging from descriptions and drawings of the type in the British Museum by W. E. China, does not belong in **Stenocranus.** All photographs were made at one magnification.

The author wishes to express his appreciation for the assistance given by the following people and institutions: Doctor Z. P. Metcalf of Raleigh, North Carolina, for the identification of his species **S. arundineus**; Doctor E. C. Van Dyke of the California Academy of Science for the exchange of paratypes of **S. felti** Van D.; Doctor K. F. Chamberlain of the New York State Museum for the dissection and comparison of Fitch's type of **S. dorsalis** with specimens sent him; Doctor W. E. China of the British Museum for drawings and comments on the type of **luteivitta** Walker; Doctor L. D. Tuthill of Iowa State College for the privilege of studying a male cotype of **S. lautus** Van. D.; Doctor John L. Caldwell of the United States Bureau of Entomology and Plant Quarantine for comparing dissected specimens with the type of **S. similis** Craw., and Messrs. Rainville and Comeau of the Museum of the Province of Quebec, Quebec, Canada, for the comparison of specimens with **S. unipunctatus** Prov.

Genus **Stenocranus** Fieber

Stenocranus Fieber, Verh. zool.-bot. Ges. Wien, XVI, p. 519 (1866), type **minutus** (Fabr.).

Rather slender insects of moderate size; head plus eyes narrower than pronotum; antennae terete, first segment about as long as wide; front long and narrow, slightly narrowed at base, with a small median carina divided on vertex near anterior margin of eyes; vertex longer than wide, carinae definite; lateral carinae of pronotum slightly curved in at base, reaching hind margin; spur on base of hind tibia triangular, rather thick with black spines along one margin.

* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

Key to the Species of Stenocranus

1. M_1 and M_2 usually stemming from R in the front wing 10
   M_1 and M_2 usually not stemming from R in the front wing 2
2. Anteriolateral fovea of vertex light in color 3
   Anteriolateral fovea of vertex black in color 4
3. Elytra practically without dark markings ..... **arundineus** Metcalf
   Elytra with some dark markings ..... **felti** Van Duzee
4. Black spot on mesal margin of elytra near outer third .... **similis** Crawford
   Without black spot on mesal margin of elytra 5
5. M_2 branched in front wing ..... **ramosus** n. sp,
   M_2 not branched in front wing 6
6. M_2 almost straight, scarcely curved to costal margin 7
   M_2 strongly curved to costal margin 9
7. Venter of genital segment almost black ..... **dorsalis** Fitch
   Venter of genital segment very light brown or white 8
8. Venter of genital segment usually light brown; usually without an orange band on outer margin of eye; process of aedeagus angularly bifid ..... **pallidus** n. sp.
   Venter of genital segment white; with an orange band on outer margin of eye; process of aedeagus smoothly bifid ..... **delicatus** n. sp.
9. Subcosta usually with a black spot; aedeagal process not bifid ..... **lautus** Van Duzee
   Subcosta usually without a black spot; aedeagal process bifid ..... **unipunctatus** Prov.
10. Usually 5 mm. or more in length 11
    Usually distinctly less than 5 mm. in length 12
11. Subcosta usually with a black spot; process of aedeagus not forked at apex ..... **lautus** Van Duzee
    Subcosta usually without a black spot; process of aedeagus forked at apex ..... **unipunctatus** Prov.
12. Vertex definitely narrowed apically, extending about one-third its length beyond eye ..... **acutus** n. sp.
    Vertex not so definitely narrowed, not extending one-third its length beyond the eye ..... **brunneus** n. sp.

1. Stenocranus dorsalis (Fitch)

Delphax dorsalis Fitch, Asa. Cat. Homop., 46, 1851.

Resembling **S. minutus** (Fabr.) but much larger and with less dark on outer portions of elytra. Length 6.5-7.5 mm.

Front three times as long as greatest width, slightly narrowed on basal third, sharply tricarinate longitudinally, infuscated either side median ridge; vertex slightly less than twice as long as basal width, median carina both broad and wide, anteriolateral fovea black; elytra broad, almost twice as long as the body, M_1 and M_2 not stemming from R.

General color stramineous with pale median dorsal line slightly darker on each side across pronotum; elytra semihyaline, veins light, small black spot on

crossveins near base of M_{3+4}, area between M and subcosta usually slightly embrowned. Venter of male stramineous with genital segment black, of female, same color with pygofer pear-shaped and dark brown.

Genitalia: In lateral view anal segment very large with two ventrally projecting hooks with the left hook usually much smaller than the right; aedeagus long and narrow, widest at base, surrounded on basal two-thirds by a process which is enlarged at middle, rapidly narrowed on apical third, flattened and curved ventrally almost into a half circle at apex; styles S-shaped, tapered to apex.

This description was made from a homotype male, one of many from Fryeburg, Me. The dissection and comparison of the type of **S. dorsalis** Fitch with the above specimen was made by K. F. Chamberlain of the New York State Museum, Albany, N.Y.

2. **Stenocranus ramosus** n. sp

Resembling **S. dorsalis** Fitch but much smaller. M_1, M_2 and M_3 from same stem and with much more dark coloring in outer half of elytra. Length 5-6.5 mm.

Front slightly more than three times as long as greatest width, slightly narrowed on basal third, tricarinated with a black line either side of middle carina; vertex about twice as long as basal width, at apex median carina high and wide, practically no carina evident at this point; elytra with M not stemming from R and M_1, M_2 and M_3 stemming together.

General color stramineous with a median longitudinal light stripe, and a narrow orange band on anterior edge of eye extending across face. Elytra semihyaline with dark spot on crossveins in region of base of M_4 and all of these apical veins more or less infuscated with the heaviest coloring in area of M_4 and subcosta.

Genitalia: Male genitalia in lateral view much as in **dorsalis** but left anal hook shorter and heavier, aedeagus more sinuate and style somewhat narrower basally and more definitely curved anteriorly with a sharp spine near middle on inner margin.

Holotype ♂, allotype ♀ and 2 ♀ paratypes, Tifton, Ga., Aug. 11, 1939, R. H. Beamer; other paratypes: 1 ♂, Hilliard, Fla., Aug. 19, 1930, P. W. Oman; 1 ♀, same place, Aug. 6, 1939, R. H. Beamer; 1 ♂ and 1 ♀, Hilliard, Fla., Oct. 5, 1938, P. W. Oman; 1 ♀, south of Naples, Fla., Oct. 9, 1938, P. W. Oman; 1 ♂, Raleigh, N.C., Oct. 16, 1938, P. W. Oman; 1 ♀, Argyle, Fla., Dec. 31, 1931, P. W. Oman.

Types and paratypes in the Snow Entomological Collections; paratypes in the United States National Museum.

3. **Stenocranus pallidus** n. sp.

Resembling **S. dorsalis** but much smaller, male genital segment but slightly embrowned and the process about the aedeagus with an angular bifid apex. Length 4.75-5.75 mm.

Front slightly less than three times as long as greatest width, slightly narrowed on basal third, sharply tricarinate with black line either side median

carina; vertex about one-fifth longer than basal width, anteriolateral fovea black; elytra with sides almost parallel extending about half their length beyond the body, M_1 and M_2 not stemming from R, M_{3+4} united, straight.

General color stramineous with pale median dorsal line; elytra semihyaline, veins and area of M_{3+4} and subcosta somewhat embrowned; last ventral segment of male slightly embrowned; pygofer of female pyriform, light brown in color.

Genitalia: In lateral view anal segment large with two medium sized, ventrally projecting processes of about the same length; aedeagus long and narrow, almost straight, slightly tapering from base to twisting apex, with a broad-based process about two-thirds as long as shaft, sharply narrowed on outer third into an angular bifid apex; styles broad on basal half with rather heavy spines near middle, sharply contracted at middle to sharp sinuate apices.

Holotype ♂, allotype ♀, 5 ♂ and 58 ♀ paratypes, East Troy, Wis., Aug. 10, 1935, P. B. Lawson; other paratypes: 4 ♂ ♂ and 6 ♀ ♀, Loda, Ill., Nov. 3, 1931, H. H. Ross. Types in the Snow Entomological Collections; paratypes in Illinois Natural History Survey, Urbana, Ill.

4. **Stenocranus delicatus** n. sp.

Resembling **S. pallidus** but eyes margined with orange and process of aedeagus longer, with a smoothly curved Y-shaped apex. Length 5.5-6 mm.

Front slightly more than three times as long as greatest width, widest near middle, slightly narrowed either way from middle, moderately tricarinate longitudinally with black stripe either side of middle; vertex about one-third longer than basal width, anteriolateral fovea black; elytra with sides widest slightly beyond middle, extending about half their length beyond the body, M_1 and M_2 not stemming from R. M_{3+4} united, almost straight.

General color stramineous with pale median dorsal line, bordered with orange across pronotum, around margin of eyes and across sides of face; elytra semihyaline, veins, area of M_{3+4} and subcosta embrowned; last ventral segment of male very light; pygofer of female pyriform, light in color.

Genitalia: In lateral view anal segment large with two large ventrally projecting processes of about equal size, slightly curving caudally; aedeagus long and narrow, widest at base, narrowed from base to tip with a radical curve near basal third; process almost as long as shaft of aedeagus partially enclosing aedeagal shaft on basal third, narrowed on outer third to about basal width of aedeagal shaft, divided smoothly Y-shaped at apex; styles gradually constricted at middle and sinuate on outer third.

Holotype ♂, allotype ♀, Douglas Co., Kans., Oct. 26, 1944, R. H. Beamer; paratypes: same place and collector, 4 ♂ ♂ and 3 ♀ ♀, Oct. 19, 1944; 4 ♂ ♂, Nov. 2, 1944; 1 ♀, Aug. 9, 1944; 1 ♂, Oct. 15, 1926; 1 pair, Aug. 17, 1944; 1 ♀, Aug. 9, 1944; 1 ♂, Lawrence, Kans., Sept. 4, 1944, R. H. Beamer; 4 ♂ ♂ and 7 ♀ ♀ ,same place, June, trap light, P. B. Lawson; 1 pair, Sand Dunes, Medora, Kans., July, 1930, D. A. Wilbur; 1 ♂, Riley Co., Kans., Sept. 20, 1929, D. A. Wilbur; 7 ♂ ♂ and 8 ♀ ♀, Conway Springs, Kans., July 6, 1944, B. Guntert; 4 ♀ ♀, Antioch, Ill., July 26, 1934, DeLong and Ross; 2 ♂ ♂, Vienna, Ill.,

June 14, 1934, DeLong and Ross; numerous specimens of both sexes, Douglas Co., Kans., Aug. 30, 1945, R. H. Beamer.

Types in the Snow Entomological Collections; paratypes in United States National Museum and Illinois Natural History Survey, Urbana, Ill.

5. Stenocranus unipunctatus (Prov.)

Delphax unipunctata Provancher. Nat. Canadian 4: 319, 1872.

Resembling **S. lautus** but usually without a small dark spot on subcosta and aedeagal process bifid. Length 4.5–5.5 mm.

Front about two and one-half times as long as greatest width, sides almost parallel on outer two-thirds, slightly narrowed basally, tricarinate longitudinally with broad, dark band either side median carina; vertex slightly less than one-third longer than basal width, anteriolateral fovea black; elytra broad, sides almost parallel, apex slightly narrowed, extending about one-third their length beyond abdomen, M_1 and M_2 quite variable in union with R. In some specimens one wing may have M stemming from R and in the other wing they may be separated. In any case, M_2 curves distinctly toward costa.

General color stramineous with white mid-dorsal line bordered on each side by more or less orange line which extends across inner margin of eye and across sides of face; elytra semihyaline, often with most of longitudinal veins darker and usually most of area beyond crossveins heavily infuscated except dark spot on subcosta usually absent; pygofer of female and genital capsule of male brown, body segments more or less infuscated with margins lighter.

Genitalia: In lateral view anal segment greatly enlarged with a pair of ventrally projecting processes, the right one definitely shorter than left; aedeagus very long and slender, widest at base, gradually narrowed to apex with an S curve on basal half; aedeagal process almost as long as aedeagus, widest at base, apparently enclosing aedeagal shaft on basal two-thirds, narrowed to bifid apex, one point recurved; styles broad at base, narrowed and sinuate on apical half, mesal shoulder quite rounded.

This species was placed in synonomy in 1912 under **S. dorsalis** Fitch by E. P. Van Duzee. Here it has remained until a comparison of accurately determined specimens of **S. dorsalis** Fitch with the Provancher type revealed it to be a distinct species.

Specimens of this species were compared with Provancher's type in the Museum of the Province of Quebec, Quebec, Canada, through the director, Mr. Paul Rainville, by Mr. Noel M. Comeau, zoologist of the Museum. I am deeply indebted to these gentlemen for their co-operation.

6. Stenocranus brunneus n. sp.

Resembles **S. unipunctatus** but much shorter, darker in color and process of aedeagus without a bifid apex. Length 3.5–4.5 mm.

Front three times as long as greatest width, widest near middle, very slightly narrowed toward apex, a little more so toward base, strongly tricarinate longitudinally, wide black stripe either side median carina; vertex at least twice as long as basal width, anteriolateral fovea black; elytra with

sides almost parallel, apices rounded, extending about one-third length beyond body; M_1 and M_2 usually stemming from R, curving to costa.

General color very dark with white median dorsal line; elytra more than half embrowned, those of the females more nearly hyaline than those of the males; veins dark except along costal margin including subcosta; body red to almost fuscous; pygofer of female and male genital segment very dark brown.

Genitalia: In lateral view anal segment very large, with two ventrally projecting processes, the right about half as long as the left; aedeagus very long and narrow, broadest at base, tapered from base to apex, abruptly curved on basal half; aedeagal process as long as aedeagus, almost three times as wide at middle as at base, narrowed sword-like on outer fourth; styles broad at base, mesal shoulders sharply rectangular, apices sinuate.

Holotype ♂, Douglas Co., Kans., June 24, 1930, P. B. Lawson, trap light; allotype ♀, 8 ♂ and 16 ♀ paratypes, Douglas Co., Kans., Oct. 18, 1944, R. H. Beamer; other paratypes: same place and collector, 5 ♂ ♂ and 7 ♀ ♀, Oct. 24, 1944; 1 ♂ and 5 ♀ ♀, Oct. 19, 1944; 2 pairs, July 13, 1944; 21 ♂ ♂ and 27 ♀ ♀, Oct. 15, 1945; 13 ♂ ♂ and 8 ♀ ♀, Oct. 3, 1945; 1 ♂, Aug. 30, 1945; 5 ♂ ♂ and 2 ♀ ♀, Shawneetown, Ill., June 24, 1936, DeLong and Ross; 4 ♂ ♂, Temple Hill, Ill., June 24, 1936, DeLong and Ross; 2 ♀ ♀, Herod, Ill., June 24, 1936, DeLong and Ross.

Types in the Snow Entomological Collections; paratypes in the Illinois Natural History Survey, Urbana, Ill.

7. **Stenocranus acutus** n. sp.

Resembling **S. brunneus** but much more slender, with sharper vertex extending one-third its length beyond the eye. Length 4-5 mm.

Front about three times as long as greatest width, sides almost parallel on apical two-thirds, slightly narrowing on basal third, moderately tricarinate longitudinally, with broad black stripe either side middle carina; vertex almost three times as long as basal width, anteriolateral fovea black; elytra very long and narrow, heavily embrowned beyond crossveins, including a spot on subcosta; M_1 and M_2 stemming from R, M_2 curving into costa.

General color very dark, with white median dorsal line; elytra more than half brown in both sexes, color following the veins even to a sizable spot on subcosta.

Genitalia: In lateral view anal segment large, with two ventrally projecting processes, the right shorter than the left; aedeagus long and narrow, widest at base, tapered to tip with about a right angle bend on basal third; aedeagal process long and narrow, almost as long as aedeagus, slightly widened on middle third and ending in a narrowed sword-shaped tip; styles rather long and narrow with sharp constriction on apical fourth, this portion curving dorsally in ventral view, mesal shoulder less than a right angle.

Holotype ♂, allotype ♀, and one pair of paratypes, Okefenoke Swamp, Ga., July 25, 1939, R. H. Beamer; other paratypes: one pair, same place and date, D. Elmo Hardy; 1 ♂, Okefenoke Swamp, Ga., Billy's Island, July 27, 1939, R. H. Beamer; one pair, Tifton, Ga., Aug. 11, 1939, R. H. Beamer; 1 ♀, St.

Mary's River, Fla., Aug. 5, 1939, J. D. Beamer; 1 ♂ and 2 ♀♀, Hilliard, Fla., Aug. 1930, R. H. Beamer; 1 ♂, Benson, N.C., Aug. 9, 1934, R. H. Beamer; 1 ♀, Atlanta, Ga., Aug. 2, 1913, R. H. Beamer; 1 ♂, Orange Grove, Miss., July 10, 1934, R. H. Beamer; 3 ♂♂, Raleigh, N.C., Oct. 16, 1938, P. W. Oman; 1 ♀, Hilliard, Fla., Oct. 5, 1938, P. W. Oman, 1 ♀, New Port Ritchey, Fla., Oct. 7, 1938, P. W. Oman.

Types and paratypes in the Snow Entomological Collections; paratypes in the United States National Museum.

8. **Stenocranus lautus** Van Duzee

Resembling **S. brunneus** but larger, usually with fewer dark markings and male styles in lateral view much longer and more slender. Length 5-6 mm.

Front about two and a half times as long as greatest width, sides almost parallel on apical two-thirds, slightly narrowed on basal third, definitely tricarinate longitudinally, with a black stripe either side median carina; vertex about three times as long as basal width, anteriolateral fovea black; elytra usually widest almost at apex, very long, with sides almost parallel, projecting about half their length beyond abdomen, M_1 and M_2 usually stemming from R but sometimes they are both free; M_2 curving to costa .

General color brownish fuscous, with white median dorsal line, elytra often more than half brown, at least the veins dark, except costa and subcosta, the latter with a small black spot at tip.

Genitalia: In lateral view anal segment large, with two long ventrally projecting processes, the right one about half as long as the left; aedeagus very long and narrow, widest at base, tapering to tip, with right angle bend beyond basal third; aedeagal process straight, slightly shorter than aedeagal shaft, widest near base, with apex turned slightly laterally and flattened; styles very long and slender, sinuately curved and narrowed on outer half, in ventral view mesal shoulder broadly rounded.

Redescribed from the cotype male taken "by Doctor E. B. Southwick near New York City" and here designated lectotype. This specimen was studied through the courtesy of Iowa State College, Ames, Iowa, and is in their collection. Specimens of this species are at hand from the following states: Kansas, Illinois, North Carolina, Washington, D.C., Virginia, Maryland, and New Hampshire.

9. **Stenocranus similis** Crawford

Stenocranus similis Crawford, David L., Proc. U.S.N.M., Vol. 46, p. 590.

Resembling **S. dorsalis** but smaller and with many dark markings on the dorsum. Length 4.5-6 mm.

Front slightly less than three times as long as broad, longitudinally tricarinate, with a dark stripe either side median carina; vertex about one-fifth longer than basal width, anteriolateral fovea black; elytra widest in region of crossveins with apex broadly rounded, about one-third longer than body, veins prominent; M_1 and M_2 not stemming from R, slightly curved toward costa.

General color quite dark, median longitudinal white line very narrow,

almost wanting; elytra mostly infuscated, with a darker spot on mesal margin at outer end of claval veins.

Genitalia: In lateral view anal segment very large, with a pair of ventrally projecting hooks; aedeagus very long and narrow, widest at base, narrowed to bent tip; aedeagal process about twice as wide on basal two-thirds as aedeagus at base, narrowed on outer third to less than fifth basal width and divided into three tips of unequal length; a second process just dorsal to the first, about two-thirds as long and about as wide as aedeagus; styles in lateral view almost straight to a dorsally bent apex, sides of outer half gradually narrowed; in ventral view sides of basal two-thirds almost parallel, outer third sharply constricted to slender curved apices.

Redescribed from specimens from Benton, Ky., which were compared with Crawford's type by Doctor J. S. Caldwell, United States Bureau of Entomology and Plant Quarantine.

10. **Stenocranus arundineus** Metcalf

Stenocranus arundineus Metcalf, Z. P., Jour. Elisha Mitchell Soc., Vol. 38, p. 197, 1923.

Resembling **S. dorsalis** but without any black markings. Length 6-8 mm. Front about three and one-half times as long as greatest width, sides almost parallel, slightly narrowed near base, strongly, longitudinally tricarinate, without black stripe either side median carina; vertex but slightly longer than basal width, anteriolateral fovea light; elytra widest at or beyond the crossveins, apices broadly rounded, extending about half their length beyond the abdomen; M_1 and M_2 not stemming from R, M_2 extending straight to costa.

General color buff, with usual light median dorsal line bordered on pronotum with orange, vertex and front also tinged with orange, no dark on body or elytra except tiny spot at tip of beak.

Genitalia: In lateral view anal segment very large with two ventrally projecting processes on each side; aedeagus very long and narrow, broadest at base, gradually narrowed to apex; aedeagal process about three times as broad at base as base of aedeagus, tapered to sharp apex, about one-third shorter than aedeagus; styles broadest at base, slightly narrowed at basal third and again more radically so on outer third, curved slightly dorsally throughout.

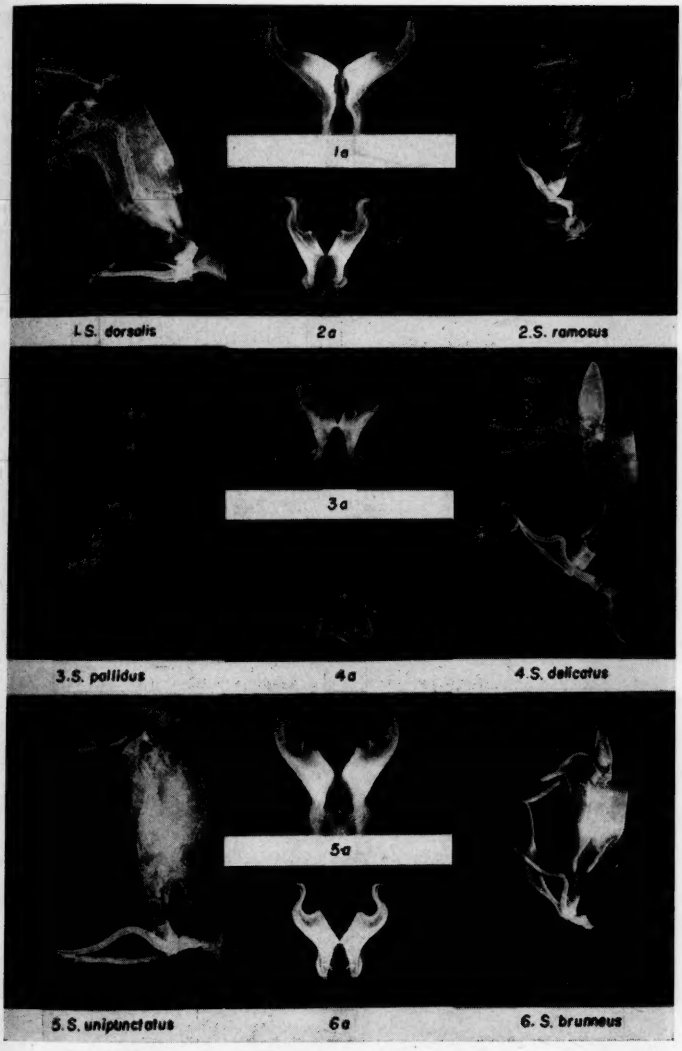
Numerous specimens at hand, swept from **Arundinaria** in Georgia and North Carolina.

11. **Stenocranus felti** Van D.

Stenocranus felti Van Duzee, E. P., Trans. Amer. Ent. Soc., Vol. 36, p. 88, 1910.

Resembling **S. dorsalis** but much smaller, elytra flaring with apices rapidly, narrowing beyond crossveins and anteriolateral fovea of vertex not black. Length 4-5 mm.

Front slightly more than twice as long as widest portion which is near the middle, narrowed very slightly toward apex and a little more toward base, moderately tricarinate longitudinally, slightly embrowned between the carina but not black; vertex about one-third longer than basal width, anteriolateral fovea not or scarcely darkened; elytra broad for their width, almost parallel

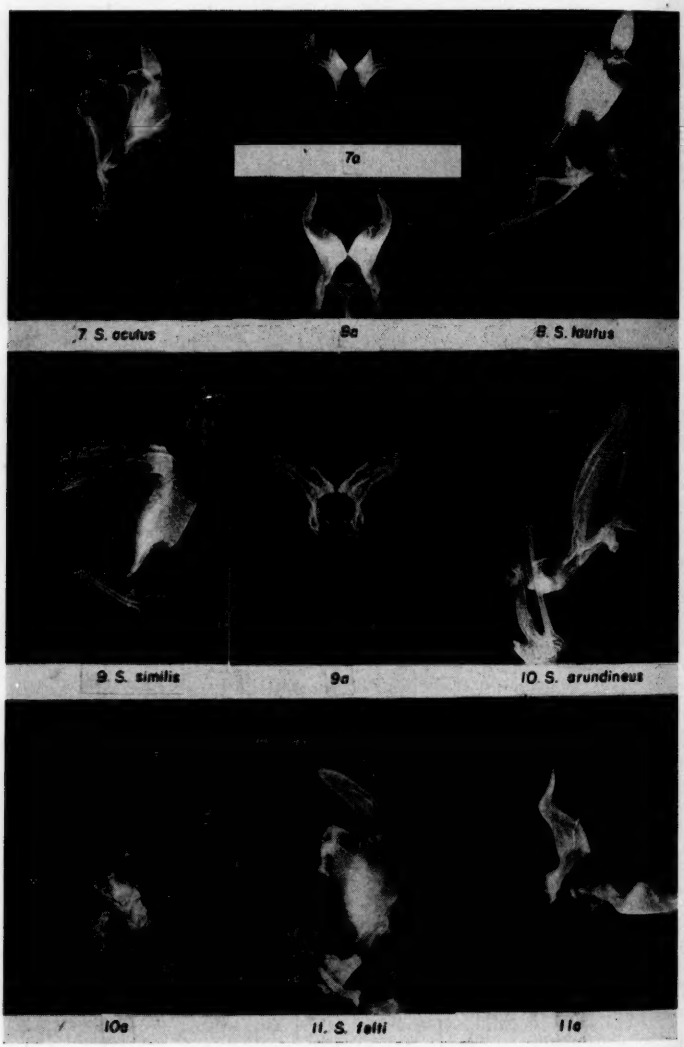


EXPLANATION OF PLATES

The plates contain the lateral view of the anal segment, the aedeagus and its process of each species and the ventral view of the styles of each species.

sided, sharply narrowed beyond crossveins; M_1 and M_2 not stemming from R, curved to costa.

General color buff with a rather broad median white line, bordered on



pronotum with orange; elytra semihyaline with veins darker; legs linneate with fuscous.

Genitalia: In lateral view anal segment very large with a pair of short ventrally projecting, blunt, bifid processes; aedeagus long and slender, widest at base, narrowed to bent tip; aedeagal process with basal width five times that of aedeagus, about two-thirds as long as aedeagus, narrowed into a diagrammatic, avecephaliform apex; styles very broad at base, narrowed from both sides on outer third to very narrow, slightly curving apices; in ventral view widest at base, narrowed throughout to an avecephaliform outer half, with a long, slender, upcurved beak.

Redescribed from a pair of paratypes kindly exchanged by the California Academy of Science with the Snow Collections. Specimens at hand from Wisconsin, Minnesota, New Hampshire, and Manitoba, Canada.

ADDITIONAL HOST AND DISTRIBUTION RECORDS OF THE SWEETPOTATO LEAF BEETLE, **TYPOPHORUS VIRIDICYANEUS** (CROTCH), (COLEOPTERA, CHRYSOMELIDAE).[1]

RALPH L. PARKER
Kansas Agricultural Experiment Station,
Manhattan, Kansas.

Recently the sweetpotato leaf beetle was found doing considerable damage to sweetpotato plants in the vicinity of Oxford, Sumner County, Kansas. Dr. H. B. Hungerford (1945)[2] published in the October issue of the Journal of the Kansas Entomological Society a short article in regard to the finding of this insect which caused considerable damage to sweetpotato tubers. He gave the distribution of this insect in Kansas and other states. He suggested that the additional information assembled by the author be published.

Hungerford (1945) gave the distribution in Kansas as follows: Douglas, Johnson, Neosho, and Sumner Counties. Additional localities are as follows:

Leavenworth County, Kansas, June 11, 1921, I. N. Chapman, 10 specimens, dock.
Marion, Marion County, Kansas, June 7, 1926, E. C. Smith (Student Collections), 2 specimens.
Frankfort, Marshall County, Kansas, June 15, 1926, W. Wullschleger (Student Collections), 4 specimens.
Onaga, Pottawatomie County, Kansas, no date given, F. F. Crevecoeur, 2 specimens.
Onaga, Pottawatomie County, Kansas, June 30, 1922, F. F. Crevecoeur, 1 specimen.
Onaga, Pottawatomie County, Kansas, June 25, 1929, F. F. Crevecoeur, 1 specimen.

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[1] Contribution No. 545, Department of Entomology.
[2] Literature cited.

Manhattan, Riley County, Kansas, no date given, E. A. Popenoe, 1 specimen.

Manhattan, Riley County, Kansas, July 17, 1892, E. A. Popenoe, 1 specimen.

Manhattan, Riley County, Kansas, July 26, 1892, E. A. Popenoe, 1 specimen.

Manhattan, Riley County, Kansas, no date given, F. Marlatt, 1 specimen.

Manhattan, Riley County, Kansas, June, F. Marlatt, 1 specimen.

Manhattan, Riley County, Kansas, July 19, 1940, Roger C. Smith, 4 specimens, field bindweed.

Topeka, Shawnee County, Kansas, July, E. A. Popenoe, 3 specimens.

Sumner County, Kansas, June 19, 1905, M. L. Briggle, 10 specimens.

In the Warren Knaus Collection there is an additional state record as follows:

White Sulphur Springs, West Virginia, Aug. 8, 1915, W. Robinson, 4 specimens.

Crotch (1873) first recorded this insect attacking sweetpotatoes and described it in 1873 as **Paria viridicyanea**. He gave for the distribution in the United States, the Middle and Southern States, and also Mexico. Chittenden (1925) listed the states of North Carolina, South Carolina, Arkansas, Mississippi, and Texas. Brannon (1938) listed the additional states of Maryland, Virginia, Kentucky, Tennessee, Georgia, and Alabama. Leng (1920) listed the additional states of Florida, Indiana, and Southern California. Hungerford (1945) listed as new distribution records, the states of Iowa, Pennsylvania, Kansas, and New Mexico. Professor Dwight Isely, University of Arkansas, Fayetteville, in a letter stated that it is found commonly in the western part of Arkansas and particularly in the northwestern region. Dr. F. A. Fenton, Oklahoma Agricultural and Mechanical College, Stillwater, also in a letter stated that it is found in Okmulgee, Delaware, Washington and Craig Counties in northeastern Oklahoma, with a range of dates of collection from June 22 to August 9.

Chittenden (1925) listed as the hosts of this insect the sweetpotato, wild sweetpotato and morning-glory or tie-vine. New hosts listed here are dock and field bindweed, **Convolvulus arvensis** L. Professor Isely reported wild Ipomea and sweetpotato as the hosts in the northwestern region of Arkansas.

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EFFECT OF TEMPERATURE ON KNOCK-DOWN AND KILL OF MOSQUITOES AND BEDBUGS EXPOSED TO DDT [1]

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Studies made to determine the effect of temperature on houseflies (**Musca domestica** L.) exposed to DDT (1-trichloro-2, 2-bis(p-chlorophenyl)ethane) (Lindquist **et al.** 1945) showed that knock-down was faster at 70° F. than at 100°. Because of the world-wide military use of DDT in the control of insects, and the possibility that temperatures may affect the results obtained, the following additional experiments on adult mosquitoes and bedbugs are reported.

Methods.—The technique followed in these studies was similar to that used on houseflies. Some of the insects were exposed in small cages or jars treated with DDT-kerosene solutions and the time required for knock-down at different temperatures was determined. Others were exposed for short periods (not long enough to cause knock-down) and then transferred to constant-temperature chambers for records of knock-down and 24-hour mortality. The relative humidity was kept at 60-70 per cent in all tests. For the tests with mosquitoes screen-wire cages were treated with DDT at the rate of 200 mg. per square foot, and for the tests with bedbugs glass jars were sprayed at the rate of 100 mg. per square foot.

Time Required for Knock-down of Mosquitoes.—Approximately 500 **Anopheles** mosquitoes (**A. quadrimaculatus** Say) were exposed at 70°, 80°, 90°, and 100° F. in a screen-wire cage treated with DDT 3 to 4 weeks previously. The time required for complete knock-down at the respective temperatures (average of 4 tests) was 140, 138, 116, and 28 minutes. Contrary to the results obtained with houseflies, the knock-down was faster at the higher temperatures. With few exceptions no flies or mosquitoes recovered after being prostrated from exposure to DDT.

Effect of Short Exposure on Mosquitoes.—A number of **Anopheles quadrimaculatus** adults were exposed for 15 minutes at 70° F. in a cage treated with DDT 30 to 40 days previously. These mosquitoes were then divided into three equal groups, transferred to clean cages, and held at different constant temperatures for 24 hours. A number of mosquitoes from the same lot were then exposed for 15 minutes at 95° in the same DDT-treated cage. These mosquitoes also were divided into three equal groups, which were handled exactly as those exposed at 70°. The results given in Table 1 shown that, for short intervals at least, exposure at 95° causes greater knock-down and mortality than exposure at 70°, irrespective of the temperature at which the mosquitoes are held after exposure.

[1] The data included in this manuscript were obtained in connection with investigations conducted at Orlando, Fla., under a transfer of funds, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the Bureau of Entomology and Plant Quarantine.

Table 1.—Knock-down and kill of Anopheles quadrimaculatus exposed for 15 minutes at 70° and 95° F. in a DDT-treated cage and then held at different temperatures in clean cages. Average of 8 tests involving approximately 1700 insects.

Temperature		Knock-down after—		Kill in 24 Hours
In DDT-treated Cage	In Clean Cage	1 Hour	6 Hours	
°F.	°F.	Per Cent	Per Cent	Per Cent
70	70	6	11	20
	80	7	7	15
	90	3	4	11
95	70	80	81	86
	80	64	44	46
	90	30	25	34

In the previous tests with houseflies there were no differences in mortality between the two exposures (5 minutes only). With mosquitoes, however, it will be noted from Table 1 that, regardless of the exposure temperature, the percentage of knock-down and kill was greatest when they were held at 70°. This is in direct agreement with results obtained on houseflies, but the reverse of knock-down results with mosquitoes continuously exposed in treated cages.

In identical tests carried out with **Culex quinquefasciatus** Say similar results were obtained, as shown in Table 2.

Table 2.—Knock-down and kill of Culex quinquefasciatus exposed for 15 minutes at 70° and 90° F. in a DDT-treated cage and then held at a different temperature in clean cages. Average of 7 tests involving approximately 1500 insects.

Temperature		Knock-down after—		Kill in 24 Hours
In DDT-treated Cage	In Clean Cage	1 Hour	6 Hours	
°F.	°F.	Per Cent	Per Cent	Per Cent
70	70	7	13	14
	80	14	16	10
	90	6	13	8
90	70	65	34	59
	80	18	14	15
	90	3	17	18

Effect of Short Exposure on Bedbugs.—Parallel tests were conducted with bedbugs, **Cimex hemipterus** F. and **C. lectularius** L. The insects were exposed for 5 minutes at 70° F. in a glass jar sprayed with DDT 20 days previously. After exposure the bedbugs were divided into three equal groups, placed in clean jars, and held at different temperatures for 48 hours. The mortality of both species was greater when the insects were held at 70° after

exposure to the DDT than when held at 80° and 90°. No difference in mortality was apparent between holding temperatures of 80° and 90°. **C. hemipterus** was considerably more resistant to DDT than **C. lectularius**. The kill in 48 hours (average of 7 tests) at 70°, 80°, and 90° was 50, 40, and 38 percent for **Cimex hemipterus** and 83, 64, and 63 percent for **C. lectularius.**

Literature Cited

Lindquist, A. W., H. G. Wilson, H. O. Schroeder, and A. H. Madden, 1945. Effect of temperatures on knock-down and kill of houseflies exposed to DDT. Jour. Econ. Ent., 38:261-4.

THE ERYTHRONEURA OF THE VULNERATA GROUP
(Homoptera-Cicadellidae)

R. H. BEAMER*

The **vulnerata** group of the genus Erythroneura is the last to be considered of those keyed out by the author in The University of Kansas Science Bulletin, Vol. XXIV, No. 14, page 262, July 15, 1936. Fifteen old species are treated, five of which are placed in synonymy, and one is described as new. The question as to the advisability of giving the various groups of Erythroneura subgeneric names has often been considered. Some of the species, however, are closely related to European forms; therefore, until such time as more and correctly identified material representing European genera now considered synonyms is available, it is probably wiser to allow the genus to stand as now divided into groups.

Key to Groups of Erythroneura

1. M-Cu cross vein present 2
   M-Cu cross vein usually absent, media and cubitus forming a more or less continuous line 3
2. Base of cell M_4 curved; two posteriorly diverging vittae usually present on vertex and pronotum ..... **obliqua group**
   Base of cell M_1 angulate; vertex and pronotum not marked as above; cross veins usually white ..... **vulnerata group**
3. Base of cell M_4 oblique ..... **maculata group**
   Base of cell M_1 square ..... **comes group**

Key to Species

1. Vertex mostly light in color 2
   Vertex not mostly light in color 5
2. Vertex broadly rounded, often with a pair of darker spots 3
   Vertex more sharply angled, spots if present elongated, usually orange ..... **vulnerata** var. **gradata** Rob.
3. Spots on vertex absent or if present usually red or pinkish .... **calva** n. sp.
   Spots on vertex dark in color 4

* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

4. Larger (2.9-3.46 mm.); pronotum and scutellum chiefly yellow .. **tecta** McA.
   Smaller (2.64-2.97 mm.); pronotum and scutellum chiefly dusky ..... **carbonata** McA.
5. Color markings of dorsum mostly black 6
   Color markings of dorsum not black 9
6. Vertex without a median longitudinal white line ..... **atrata** Johns.
   Vertex with a median longitudinal white line 7
7. Disk and posterior margin of pronotum usually almost white in color ..... **nigra** var. **decora** McA.
   Disk and posterior margin of pronotum black 8
8. Vertex blunt, usually with white spots next eyes near base ..... **nigra** (Gill.)
   Vertex definitely more acute, usually without light spots at base next eyes ..... **nigerrima** McA.
9. Slightly more than anterior half of dorsum dark in color, remainder light ..... **bicolorata** Bmr.
   Evenly colored throughout 10
10. Disk of pronotum with large brown, heart-shaped mark .... **fulmina** McA.
    Disk of pronotum otherwise marked 11
11. Pygofer hook short, less than half as long as pygofer (Rocky Mts., east) ..... **vulnerata** Fitch
    Pygofer hook long, about one half as long as pygofer (Ariz., Calif.) ..... **variabilis** Bmr.

1. Erythroneura vulnerata Fitch

Erythroneura vulnerata Fitch, Asa. N.Y. State Cab. Nat. Hist., pp. 62-63, 1851.

"Fulvous-brown spotted and lined with whitish; elytra with an abbreviated yellowish-white vitta on the outer margin, interrupted near the middle by an oblique black line, and towards the apex by an oblique sanguineous one; tips dusky, with whitish nervures and spots; a whitish medial line common to the vertex, thorax and scutel; beneath black, legs pallid. Length 0.12. On raspberry bushes, grapevines and other situations where the foliage is dense, often in great numbers. No. 819, male; 820, female."

Internal ♂ genitalia: Pygofer hook quite variable from a bifid sharp-pointed structure to a short blunt, somewhat avicephaliform, process (Fig. 1a). Style with foot of medium size; heel normal; base straight; anterior point short, slightly less than a right angle; posterior point with sides converging, usually shorter than base, forming greater than a right angle with base. Aedeagus in dorsoventral view very short and broad, composed mostly of a pair of heavy lateral processes curving slightly medianly.

The variations in the shape of the pygofer hooks of this species have presented quite a problem. All of them, however ,were found in specimens swept from Boston ivy, Virginia creeper, and grape, each host taken in a separate location. Until such time as rearing data prove otherwise, it is best to consider them as variations of one species rather than as distinct forms.

This is a wide-spread species from the Rocky Mountains eastward. It is

found on many hosts and is a real pest of grape, Virginia creeper and Boston ivy.

Erythroneura vulnerata var. gradata Rob.

Erythroneura gradata Robinson, W., Can. Ent., Vol. LVI, No. 3, p. 58, 1924.

Dissections of males of **E. gradata** reveal the same variations in pygofer hooks as have been found in **vulnerata.** No specimens of this species have been taken out of the growing season and teneral specimens of **vulnerata** have been collected on many occasions which closely resemble **gradata** in color. This is fairly conclusive evidence that **gradata** is just a seasonal color variation of **vulnerata.**

2. Erythroneura variabilis Beamer

Erythroneura variabilis Beamer, R. H., Annals Ent. Soc. Am., Vol. XXII, p. 126, 1929.

This species is generally a little larger than **E. vulnerata** Fitch and has about the same color and markings. It is easily separated from **E. vulnerata** by the large bifid pygofer hook which is about half as long as the pygofer, and by its western distribution. Numerous specimens are at hand from Arizona and California. This species seems to take the place of **E. vulnerata** in Arizona and Southern California.

3. Erythroneura fulmina McAtee

Erythroneura vulnerata var. **fulmina** McAtee, W. L. Trans. Amer. Ent. Soc., Aug. 26, p. 274, 1920.

Erythroneura pulchella Robinson, W. Can Ent., Vol. LVI, p. 155, 1924.

Resembling **E. vulnerata** Fitch but markings darker brown, margined with red. Lighter areas milky white. The deep velvety brown color of the disk of the vertex, pronotum and basal angles of the scutellum separates this species from **E. vulnerata.**

Internal ♂ genitalia: Pygofer hook about one-third as long as pygofer and three times as long as its own width, bifid with outer point longer, inner point curving toward outer. Aedeagus as in **E. vulnerata.** Style with large foot; heel medium, base straight; anterior point short, slightly less than right angle; posterior point almost as long as base, narrow, sides converging.

Types studied in United States National Museum.

This is not a very common species. Specimens have been studied from Maryland, Illinois and Kansas.

4. Erythroneura bicolorata Beamer

Erythroneura bicolorata Beamer, R. H. Jour. Kans. Ent. Soc., Vol. X, p. 11 ,1937.

This species resembles **E. vulnerata** but is easily separated from it by the dark anterior half of the body and the light posterior portion. The internal male gentalia show a closer relation to **E. fulmina** McA. but the above characters easily separate it from this species. This is one of the rarer species in this group, being known only from the type series.

5. Erythroneura nigra (Gill.)

Typhlocyba vulnerata var. **niger** Gillette, C. P. Proc. U.S. National Museum, Vol. XX, p. 765, 1898.

Typhlocyba nigridorsum DeLong, D. M. Bull. No. 17, Tenn. State Board of Ent., June, 1916, p. 110.

Resembling **E. vulnerata** but color of dorsum mostly black instead of

green or brown; aedeagus without large basal processes and with a definite shaft with three short terminal processes.

Color: Dorsum generally black with ivory to yellowish markings. Front ivory, reaching well up over margin of vertex, often connected with a pair of small ivory spots next eyes near base of vertex and with narrow median longitudinal line usually enlarged anteriorly. Pronotum usually with five ivory spots inside anterior border. Scutellum sometimes with faint median ivory line. Elytra with or without large spot near tip of scutellum; costal plaque and spot on costa just before cross veins, ivory; cross veins and usually a number of areoles at apex of clavi ivory to semihyaline.

Internal ♂ genitalia: Pygofer hook with sides slightly converging, bent at right angles near middle. Style with small foot; base straight, heel medium; anterior point short, slightly less than a right angle; posterior point almost half as long as base, about as thick at base as length, marginal line connecting anterior and posterior points curved outward. Aedeagus with shaft tubular, short, slightly tapered from base half way to tip; apex with three spines, one on each side and one on venter, about as long as diameter of shaft and extended at right angles to it, slightly curved.

Type ♀, No. 3452, in U.S. National Museum.

This is a very common form. It is often collected on various species of **Polygonum.**

Erythroneura nigra var. decora McA.

Erythroneura vulnerata var. **decora** McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 274, 1920.

Many dissections of males of **decora** McA. reveal the same characteristics as **nigra** (Gill.). The external markings are so radically different that the name is retained as a variety of **E. nigra.** The original description follows: "Color markings smoky to black, pale areas conspicuous by contrast and much larger than in variety **vulnerata,** vertex pale yellow with two broad black vittae inclosing a narrow median pale one, pronotum with median and two discal pale yellow spots, sometimes merged, spots and dashes of same color near lateral and anterior margins; median scutellar vitta broad and basal triangles paler within; tegminal pale areas large, that on base of clavus conspicuous, pale yellow; costal plaque pale yellow. Length 2.83 mm."

This is a very common form on various species of **Polygonum** and is quite variable in color.

6. Erythroneura nigerrima McAtee

Erythroneura vulnerata var. **nigerrima** McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 275, 1920.

Erythroneura atra Johnson, Dorothy M. Bull. Ohio Biol. Survey, Vol. 39, p. 96, 1935.

Resembling **E. nigra** (Gill.) but often without or almost without the light markings on the elytra, vertex much sharper, usually without light basal spots next eyes; posterior point of style as long as foot and lateral apical processes of aedeagus almost as long as shaft.

"A darker form even than variety **niger,** the pale areas on clavus being smaller, semi-hyaline and inconspicuous; in extreme examples there is only a single pale point at two-thirds length of clavus, and one on corium near it,

besides the pale yellow costal plaque and paler costal area just posterior. Length 2.64 mm."

Internal ♂ genitalia: Pygofer hook as in **E. nigra** but larger, with the bend closer to the base. Foot of style characteristic; heel large; base straight, curved to meet posterior point which is broader at base than foot at narrowest place, slightly curved in and as long as foot; anterior point barely evident. Aedeagus cylindrical, sides almost parallel, with a pair of lateral apical recurved processes two-thirds as long as shaft; tip of shaft with much shorter dorsal lip-like structure.

This is a not uncommon species with much the same distribution as **E. nigra.**

Types in the McAtee Collection, U.S. National Museum.

7. **Erythroneura atrata** Johnson

Erythroneura atrata Johnson, Dorothy M. Ohio Biol. Survey Bull. Vol. 39, p. 97, 1935.

Resembling **E. nigerrima** McA. but smaller, vertex black except very broad ivory margin, and style with very large, sickle-shaped posterior point.

"Very small stout dark species. Vertex dark brown, broadly yellow bordered, the pale area extending down middle a short distance, two lateral pale spots before eyes; pronotum entirely brown but for short anteromedian pale dash; scutellum dark with suggestion of pale median vitta; elytra—clavus and corium entirely dark but for two pale spots, one at middle of clavus, the other just below it on corium; plaque bright yellow, small white area posterior to it: apical cells dark, crossveins and apical veins at tip pale, semihyaline areas at outer middle of M_4 and outer part of R_1. Below, head and legs pale, thorax and abdomen dark.

"Length: 2.25 mm.

"Inner male genitalia: Styles very large, heel prominent, base straight, anterior point inconspicuous, posterior point very long, twice length of foot, curved in beyond heel; oedagus very short with very small lateral spines and dorsal keel; pygofer hook with heavy quadrilateral base and long heavy spine curved in, parallel-sided to tip where it is abruptly narrowed to a fine point."

Not a common species if the number of specimens in collections is any indication.

Types in the collection at Ohio State University, Columbus, Ohio.

8. **Erythroneura tecta** McAtee

Erythroneura tecta McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 289, 1920.

This species belongs in the **vulnerata** group of **Erythroneura** because of the wing venation of the elytra and the internal genitalia of the male which resemble those of **E. nigra** (Gill.). It may be separated from this species by the light color of the vertex, the absence of points on the foot of the style and the larger, more nearly sword-shaped, pygofer hook.

"Ground color of scutellum and anterior parts pale yellow; vertex with two round dusky spots on disc which are more or less connected with each other, with inner side of orbits, and with posterior margin by arcuate reddish markings; pronotum with an angulate brown vitta, sometimes broken up into dusky spots on each side, and two discal spots sometimes concealed

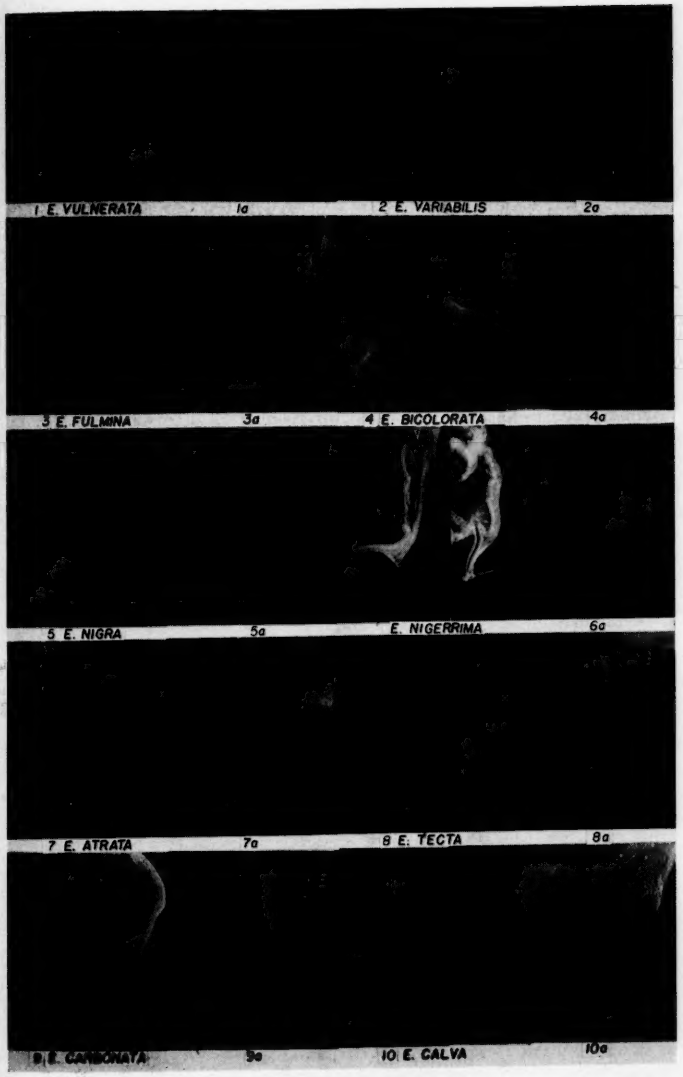
by reddish markings, which when fully developed form a U based on posterior margin; scutellum with basal triangles black, margins and apex reddish; tegmina whitish hyaline (dorsal pale areas more or less opaque); clavus is perhaps best described by saying it is red, sometimes brownish, except the whitish hyaline extreme base, a large, more opaque whitish or pale yellow area near scutellum and entirely within claval (second anal) vein a smaller whitish area overlapping apex of last but entirely outside claval vein, and a small transverse whitish band just before apex; corium more or less bluish or dusky between veins, the veins often reddish; two whitish areas bounded by red between third sector and claval suture, costal plaque pale yellow, more or less overlaid by opaque white, bounded at both ends by dusky clouds, costa hyaline posteriorly, interrupted by red cross-veins; apical cells fumose with a darker area at base of fourth cell and another at apex of wings, common to second and third cells, often forming an oblique vitta. Face pale yellowish, a dark spot on base of clypeus, two others above just within antennal bases, lower surface of vertex marked by a few reddish lines; legs pinkish livid; body slaty, or with pale yellowish edgings. Length 2.9-3 mm."

Internal ♂ genitalia: Pygofer hook more than one-third as long as pygofer, flat and slightly curved. Style with medium foot; heel small; base straight; anterior point less than a right angle, and posterior point very short. Aedeagus cylindrical, almost three times as wide at base as at tip, with a spine protruding slightly toward apex from middle of ventral margin, as long as thickness of shaft; apex of shaft with dorsal margin lip-like.

Types, in McAtee Collection in U.S. National Museum, studied along with other specimens from the type locality, from Mississippi and Illinois .

Explanation of Plate

1 Dorsoventral view of aedeagus and style of **E. vulnerata** Fitch.
1a Lateral view of pygofer hooks of **E. vulnerata** Fitch, showing variation in form.
2 Dorsoventral view of aedeagus and style of **E. variabilis** Beamer.
2a Lateral view of pygofer hook of **E. variabilis** Beamer.
3 Dorsoventral view of aedeagus and style of **E. fulmina** McAtee.
3a Lateral view of pygofer hook of **E. fulmina** McAtee.
4 Dorsoventral view of aedeagus and style of **E. bicolorata** Beamer, aedeagus partially turned laterally.
4a Lateral view of pygofer hook of **E. bicolorata** Beamer.
5 Lateral view of aedeagus and dorsoventral view of style of **E. nigra** (Gill.).
5a Lateral view of pygofer hook of **E. nigra** (Gill.).
6 Dorsoventral view of style and lateral view of aedeagus of **E. nigerrima** McAtee.
6a Lateral view of pygofer hook of **E. nigerrima** McAtee.
7 Lateral view of aedeagus and dorsoventral view of style of **E. atrata** Johnson.
7a Lateral view of pygofer hook of **E. atrata** Johnson.
8 Dorsoventral view of style and lateral view of aedeagus of **E. tecta** McAtee.
8a Lateral view of pygofer hook of **E. tecta** McAtee.
9 Dorsoventral view of style and lateral view of aedeagus of **E. carbonata** McAtee.
9a Lateral view of pygofer hook of **E. carbonata** McAtee.
10 Dorsoventral view of style and lateral view of aedeagus of **E. calva**, n. sp.
10a Lateral view of pygofer hook of **E. calva**, n. sp.
(All photographs enlarged to same diameter.)


1 E. VULNERATA
1a
2 E. VARIABILIS
2a
3 E. FULMINA
3a
4 E. BICOLORATA
4a
5 E. NIGRA
5a
E. NIGERRIMA
6a
7 E. ATRATA
7a
8 E. TECTA
8a
9 E. CARBONARIA
9a
10 E. CALVA
10a

9. Erythroneura carbonata McAtee

Erythroneura tecta var. **carbonata** McAtee, W. L. Trans. Am. Ent. Soc., Vol. 46, p. 289, 1920.

Resembling **E. tecta** but pronotum and scutellum chiefly dark. Length 2.64-2.97 mm.

Color: Vertex ivory, with a pair of dusky round spots on disc, often connected with hind margin. Pronotum with a crown-shaped lighter mark on disc, remainder more or less dusky. Scutellum ivory to yellow with basal angles dark. Elytra dark with a large spot at tip of scutellum, an angular one at tip of clavi and costal plaque, ivory; some spots anterior and posterior to angular claval spot and costal margin opposite crossveins, semihyaline; crossveins light. Any of the light areas may be bordered with pink or red.

Internal ♂ genitalia: Pygofer hook almost straight with sides converging from base to apex. Style with foot medium, heel rather prominent, base slightly curved, anterior point less than a right angle, sharp, outer face of foot sloping toward heel, posterior point almost non-existent. Aedeagus cylindrical, with sides almost parallel, sharply contracted just before apex with a short, sharp spine located ventrally on the shoulder thus formed and extending almost parallel with shaft; dorsal margin of apex of shaft with a distinct curved lip.

Described from a paratype male and numerous other specimens from the type locality. Other specimens are at hand from Manitoba, Canada, and a series was taken in Cherokee County, Kansas, from **Serionema ciliatum** (L.).

Types in McAtee Collection, U.S. National Museum.

10. Erythroneura calva n. sp.

Resembling **E. tecta** but usually without the two black spots on vertex, and dark coloring on elytra mostly red. Length 3.25-3.5 mm.

Color: Vertex ivory with only an indication of three pinkish spots on disk, rarely an indication of tiny dark spots. Pronotum ivory with a red, anteriorly hollowed-out, spot occupying most of disk basally, more or less fuscous on sides. Scutellum ivory with semblance of dark basal angles, tip red. Elytra with longitudinal zigzag fascous reddish stripes; large spot at tip of scutellum, another at tip of clavi, and costal plaque, ivory; tip of clavi usually pink to red; more or less hyaline areas on costal margin, at crossveins and in apical cells. Inner half of zigzag stripe usually mostly red.

Internal ♂ genitalia: Pygofer hook about one-third as long as pygofer, rather broad at base, evenly narrowed and bent ventrally into a half circle. Foot large, tapered toward toe, heel prominent, base straight, anterior point less than a right angle, face of toe sloping posteriorly inward, posterior point very short and sharp. Aedeagus cylindrical, widest at base, sharply narrowed on outer third, with an anteriorly protruding ventral spine on this shoulder extending almost to apex; dorsal margin of shaft bent in a short lip.

Holotype male, allotype female, 21 ♂ and 20 ♀ paratypes, Keld, Manitoba, Canada, Aug. 8, 1937, R. H. Beamer.

Types in the Snow Entomological Collections.

TWO NEW PARACLIUS (Diptera: Dolichopodidae)[1]

F. C. HARMSTON and G. F. KNOWLTON[2]

Collections of Dolichopodidae taken during recent years have made possible this treatment of three interesting species of **Paraclius**. Two of the species are here described as new and a key is given to aid in their separation.

Paraclius utahensis n. sp.

Male. Length, 4 mm.; length of wing, 4 mm. Face equaling the width of the base of fore femora, its sides parallel, without transverse ridge, silvery pollinose. Front concolorous with face. Antennae black; second joint with a prominent black bristle on upper edge and a few smaller hairs; third joint slightly longer than wide, rounded at tip. Arista inserted near the middle of third joint, tapering rapidly, pubescent. Lateral and inferior orbital cilia white; a strong bristle near the lower corner of the eyes, and about eight of the upper cilia are black. Palpi black with thin white pollen and black hairs on the anterior surface.

Dorsum of thorax and the scutellum metallic, dark green; pleurae subshining, the dull greenish ground color barely perceptible under the dense gray pollen. Abdomen dark green, metallic, the hind margins of segments narrowly black, the lateral portions silvery pollinose; bristles arising from the posterior margins of segments black, strong. Hypopygium black, lightly dusted with silvery pollen; outer lamellae consist of a pair of black, oval disks, the apical portion broadly rounded and fringed with long, black bristles, the basal margin with delicate brownish hairs.

Coxae and legs black, lightly dusted with white pollen; the base of fore tibiae brownish. Anterior surfaces of fore and middle coxae heavily dusted with white pollen, clothed with black hairs and with the usual black bristles at tip. Middle and hind femora each with a single preapical bristle. Middle and hind tibiae with prominent bristles on posterior surfaces, the fore tibiae with about four prominent bristles on outer surface. Tarsi black, the joints of fore tarsi as 20-7-6-5-6; of middle tarsi as 25-12-10-7-7; of hind tarsi as 20-20-15-10-7. Halteres yellow; calypters brown with long brownish cilia, the latter delicate and arranged in two clumps so that they may be spread fan-like or closed to form a long pencil of hairs.

Wings grayish hyaline; costa greatly enlarged on first section, midway between the base of wing and the tip of first vein; this enlarged portion of costa is approximately the length of the cross-vein and tapers abruptly on last portion; fourth vein abruptly bent slightly beyond the middle of last section, from which point it converges strongly toward the tip of third vein, to end in wing margin well before the wing tip; cross-vein approximately the length of last section of fifth vein; posterior margin broadly incised at tip of sixth vein, forming a prominent lobe at anal angle.

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[1] Contribution from the Zoology and Entomology Department, Utah State Agricultural College, Logan.

[2] Graduate student and professor, respectively.

Female. Coloration as in the male; face wider, its tip broadly rounded. Wing as in the male except that the costa is much less enlarged on first section; the bend in last section of fourth vein less abrupt. Cilia of calypters coarse, less numerous than in the male.

Described from eleven males and six females, all taken at St. George, Utah, June 22, 1940 by F. C. Harmston. Holotype and allotype to be deposited in the U.S. National Museum; paratypes in the insect collections of the Utah Agricultural Experiment Station and the senior author.

Differentia. Paraclius utahensis n. sp. closely resembles **P. albonotatus** Lw. The resemblance is so great that the Utah specimens were identified as being **albonotatus** until material of the latter species was taken at New Smyrna, Florida in 1943 which permitted comparison. The anal angle of wing in **utahensis** forms a prominent lobe or angle, whereas in **albonotatus,** and likewise in **indianus** n. sp. the anal angle is evenly rounded and tapers gradually to the root of wing. The bristles at apex of hypopygial lamellae in **albonotatus** are long and curled or "crinkly" at tip; in the other two species these bristles are shorter and their tips are not curled or "crinkly".

Paraclius indianus n. sp.

Male. Length, 4.5 mm.; length of wing, 4.5 mm. Face reaching the lower corner of eyes, narrowed on last portion, the tip rounded; a prominent transverse ridge near the middle, yellowish-gray on upper half, silvery pollinose on lower half. Palpi silvery pollinose, with black hairs and bristles on upper surface. Front bright, silvery pollinose, concolorous with lower half of face. Antennae black; first joint with scattered hairs on upper surface; second joint with a single strong bristle and several smaller hairs on upper surface; third joint scarcely longer than wide, rounded at apex. Arista inserted near the base of third joint; first portion thick, last portion tapering rapidly, pubescent. Lateral and inferior orbital cilia white; about seven of the upper cilia on each side and a prominent bristle near the lower corner of eyes are black.

Dorsum of thorax and the scutellum metallic, dark green, the central portion with violet reflections; ground color of pleurae concolorous with dorsum, heavily dusted with silvery-gray pollen. Abdomen metallic, dark green, the lower lateral portions with grayish pollen; hairs and bristles black, those on apical margins of segments particularly strong. Hypopygium large, black, lightly dusted with white pollen; outer lamellae nearly circular, black, the stem more brownish, the upper edge (morphologically lower) with prominent black bristles which are approximately the same length as the diameter of lamellae; remainder of lamellae fringed with delicate, brown hairs along the edge.

Coxae concolorous with pleurae; anterior surfaces of the fore and middle pairs densely silvery pollinose, clothed with black hairs and with the usual black bristles at the tip. Hind coxae with prominent black bristle on outer side. Femora black, in some lights with a greenish reflection which is somewhat dulled by white pollen. Middle and hind femora each with a single pre-

apical bristle. Fore and middle tibiae yellow, shading into brown toward the apices; posterior tibiae brown, the apical one-fourth black. All tibiae with conspicuous bristles. Tarsi black, the anterior basitarsus brownish at base. Joints of fore tarsi as 20-7-6-5-6; of middle tarsi as 25-13-10-7-6; of hind tarsi as 20-20-15-10-7. Halteres yellow; calypters yellow with brown tip, their cilia coarse, black, sparse.

Wings smoky gray; first section of costa greatly enlarged, so that it nearly fills the costal cell; this enlarged portion of costa is approximately the same length as middle basitarsus and its width equals the width of the middle tibia, on the last portion it tapers gradually into the costa; fourth vein with an abrupt bend near the middle of last section, from which point it converges sharply toward the tip of third vein; cross-vein at right angles to fourth vein, its length equals the last section of fifth vein; posterior margin of wing broadly incised at the tip of the fifth and sixth veins so that the anal angle, although narrowed, is somewhat rounded from the tip of sixth vein.

Female. Like the male in general coloration. Face slightly wider, wholly silvery pollinose, the transverse ridge prominent. First section of costa enlarged, but much less prominent than in the male; wing otherwise as in male.

Described from nine males and eleven females all taken at Indianapolis, Indiana, June 11, 1944 by F. C. Harmston. Holotype and allotype to be deposited in the U.S. National Museum; paratypes in the insect collections of the Utah Agricultural Experiment Station and the senior author.

Differentia. Paraclius indianus n. sp. closely resembles **P. utahensis** n. sp. and **P. albonotatus** Lw. The three species are alike in possessing black femora, greatly enlarged first portion of costal vein and white orbital cilia. **Indianus** differs from both in possessing a prominent transverse ridge near the middle of face and in having the face yellowish-gray on the upper half; whereas **utahensis** and **albonotatus** have face wholly silvery pollinose and without trace of a transverse ridge. The enlarged portion of costa in **indianus** is nearly twice the length of the enlarged costal section in the other two species and tapers gradually on the apical portion; in both **utahensis** and **albonotatus** the thickened section of costa is rather abrupt at tip.

The following key will serve to separate the males of the three species:

1. Face with prominent transverse ridge near the middle; grayish-yellow on upper portion, silvery pollinose on lower half; cilia of calypters black, coarse, sparse ..... **indianus n. sp.**
   Face without prominent transverse ridge, silvery pollinose; cilia of calypters delicate, brownish 2
2. Anal angle of wing evenly rounded, tapering gradually into root of wing; bristles of hypopygial lamellae long and "crinkly" at tips ..... **albonotatus** Lw.
   Anal angle of wing with prominent lobe; bristles of lamellae shorter, their tips plain ..... **utahensis** n. sp.

POPULATION STUDIES ON COCHLIOMYIA AMERICANA IN ARIZONA

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Very little has been known regarding variations of the distribution of the screwworm (**Cochliomyia americana** C. and P.) within a small area, or the amount of shifting of population that occurs with changes in ecological factors. In many localities in Arizona the changes in some of these factors, such as elevation and plant association, are so great within relatively small areas that studies were initiated to obtain data on the relationship between various environmental factors and the population of **C. americana.** Parman (2) has discussed the broader aspects of adult populations as influenced by weather conditions. Studies made during the summer and fall of 1938 at Somerton, Tempe, Wickenburg, Sonoita, and Nogales are reported herein.

Many ranchers had reported differences in severity of screwworm attack in different ranges on the same ranch. They learned which ranges were likely to have the most infestations under various ecological conditions and thus require careful inspection. Since these differences could not be attributed to variations in hosts or ranch management, it was obvious that the screwworm fly was influenced in its activity by environmental differences within a small area.

Traps and Bait.—All-metal, cone-type traps were used in these tests. Each trap was baited with 2 pounds of liver and 1½ gallons of water, and designated by the name of the town near which it was located.

Trap Locations.—The areas studied were all in southern Arizona and varied in ecological conditions from irrigated valley and semidesert to desert grass and oak woodland, with elevations from 125 feet at Somerton to over 5,000 feet on the range on the east slope of the Santa Rita Mountains. The normal annual rainfall in these areas ranges from 3.71 inches near Somerton to approximately 18 inches in the Sonoita area. The mean monthly temperatures reach 90° F. at Yuma in August and drop to below 60° in December. At Tempe and Wickenburg the temperatures are 5° to 10° cooler, and at Nogales 10° to 15° cooler, than the mean temperatures at Yuma.

Three traps were used at each location. They were arranged in a triangle, approximately 3 miles apart. This distance between the traps was chosen arbitrarily because of convenience of local conditions, and because it was considered a distance at which traps would have little influence on each other. With the triangular arrangement it was believed that if the distance between traps was not sufficient to prevent a trap from affecting an adjacent area, each trap might tend to be influenced equally by the other traps. All the traps were in partial shade.

At Somerton (elevation 125 ft.) trap 1 was placed on the edge of an alfalfa field in which sheep were pastured periodically, and adjacent to a hospital pen

[1] The writer expresses his appreciation for the suggestions and criticisms made by D. C. Parman.

where 20 or more "wormies" (infested animals) were kept; trap 2 in a young pecan grove which was interplanted with sweetclover, and where sheep were on pasture during the time the trap was in operation; and trap 3 on the edge of an alfalfa field with no animals in the vicinity, except for a herd of dairy cattle which was not near the traps while they were in operation.

At Tempe (elevation 165 ft.) all the traps were placed on dairy ranches in an irrigated valley. Owing to local conditions trap 3 was placed slightly more than 3 miles from the other two traps. The populations of sheep and feeder cattle in this area are seasonal, with the influx beginning in the fall.

At Wickenburg (elevation 2,100 ft) traps 1 and 2 were located on the Hassayampa River, where the moisture conditions and wooded environs were favorable for blowfly survival, and trap 3 was located on the desert. A limited number of cattle were present along the river. The sheep population was seasonal.

At Sonoita (elevation approximately 4,500 to 5,000 ft.) the traps were located on a large cattle ranch between the Santa Rita and Whetstone Mountains. Each trap was located at a stock-watering place. Trap 1 was in a mesquite draw that sloped back toward the Santa Rita Mountains; trap 2 at a still higher elevation in an oak environment with rarely a low scrubby mesquite; and trap 3 in a valley near a flowing stream where mesquite growth was dense.

At Nogales (elevation 3,600 to over 4,000 ft.) trap 1 was located on Nogales Creek 1 mile above where it enters the Santa Cruz River, and trap 2 was located 3 miles north on the Santa Cruz River. Trap 3 was moved about the other traps. First it was located at Tumacacori, approximately 12 miles north on the Santa Cruz River; second 3 miles east of trap 1 on the Santa Cruz River; and third on the Ruby and Bear Valley Road to the south, where it remained until the trapping was discontinued in the fall. Traps 1 and 2 were in desert grass (mesquite) environment. Trap 3, in its last location, was at a much higher elevation than traps 1 and 2 and in an area where oak woodlands were beginning to predominate in the draws.

Weather Conditions During Tests.—These tests were conducted during a cycle of years when the rainfall was below normal. The 1938 season was very droughty. Although some areas had good rainfall, the rainfall was not general, and on the whole conditions were unfavorable for a high population of **Cochliomyia americana**. However, the **C. americana** population was large enough in Arizona to infest all available wounds during the screwworm season.

Results.—The results of these tests are shown in Table 1. At Somerton it was found that extremely high temperatures will not prevent an increase in the population of **Cochliomyia americana**, if the moisture, as on irrigated lands, is favorable for their development. Furthermore, the flies were more abundant in the vicinity of their host, an area protected from the hot, dry winds and where some shade was available.

Table 1.—Summary of data on populations of Cochliomyia americana collected in traps in different locations in Arizona subject to various environmental factors. Three traps operated at each location. 1938.

Date Trap Emptied	Number of Females Taken		
	Trap 1	Trap 2	Trap 3
Somerton			
July 14	20	53	5
July 28	34	126	8
August 10	10	148	10
Tempe			
August 24	7	2	22
September 12	17	4	21
September 27	7	12	49
October 12	23	17	69
October 27	33	30	64
November 12	40	33	32
November 29	7	6	11
Wickenburg			
August 29	7	5	2
September 15	37	18	0
September 29	41	7	0
October 14	30	18	1
October 29	25	21	1
November 14	1	2	0
November 28	1	1	0
Sonoita			
September 7	118	5	51
September 22	112	22	44
October 7	124	3	59
October 21	38	2	111
November 4	33	0	60
November 18	3	0	1
December 1	2	0	0
Nogales			
August 22	17	34	10[1]
September 6	20	28	79[1]
September 21	24	65	42[2]
October 6	55	25	125[3]
October 20	30	7	26
November 3	12	12	3
November 17	0	4	0
December 2	0	2	1

[1] At Tumacacori.
[2] On Santa Cruz River 3 miles east of trap 1.
[3] On Ruby and Bear Valley Road 3 miles from Nogales highway in this and subsequent periods.

At Tempe the ecological conditions were more uniform both as to plant association and animal host. There was no outstanding variation among the traps.

The principal point brought out by the data obtained with the Wickenburg traps was the close association of **Cochliomyia americana** along the streams in the more moist environments during periods of hot, dry weather. A similar situation was later found in Texas when a trap on the west branch of the Nueces River took 1,044 **C. americana** females in the 2 weeks ending June 28, 1939, a period of severe drought.

Local concentrations of **Cochliomyia americana** occurred in favorable areas when the surrounding areas were unfavorable owing to extreme ecological conditions. Parish and Cushing (1), in experiments conducted at Menard, Tex., before the identity of the two species of **Cochliomyia** was known, found that traps located in very light shade near a running stream or large pond, protected from direct wind and surrounded with timber and underbrush of medium density, were the most favorable.

At Sonoita the number of screwworm flies taken at the more open location at a higher elevation (trap 2) was distinctly smaller than the numbers taken in traps 1 and 3 located in the more shaded mesquite draws. This higher, open location was unfavorable for all blowflies except **Sarcophaga.** The peak catches with traps 1 and 3 occurred at different times. The data were insufficient to explain this variation.

At Nogales traps 1 and 2, which were located in similar environments, took similar catches. On September 21 trap 3 was moved to a range which was reported to have heavy infestations. The catch of 125 **Cochliomyia americana** females in the following 2 weeks was the highest obtained in the Nogales area. By this time summer rains had occurred and open ranges away from the water courses and mesquite draws were highly favorable for **C. americana.**

Summary.—Adults of **Cochliomyia americana** C. and P. are uniformly distributed over relatively small areas only when the ecological conditions are uniform. Extremely high temperatures are not a limiting factor in the development of these insects when moisture conditions are favorable. The presence of a larger fly population in the immediate vicinity of the host material is indicated. During hot, dry weather the flies in the range sections are restricted to the vicinity of streams and mesquite draws where shade and moisture is available. Some shifting of population to favorable areas was indicated.

Literature Cited

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THE CERCOPIDAE OR SPITTLEBUGS OF MISSOURI

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This is a continuation of the author's efforts to make better known the insect fauna of Missouri.

In literature there are several Cercopid species recorded for the state which apparently do not belong on our list. **Aphrophora parallela** was originally described by Say (1824) under the generic name **Cercopis**, with the remark, "This species also occurs in Missouri and Arkansa." Goding (1895) repeats these data and places the species in the genus **Aphrophora**. Later Ball (1898) expresses doubt as to the validity of these records and says that they "probably refer to some other species," possibly **inornata** Ball. Van Duzee (1917) apparently does not consider this as probable and includes these records under **A. parallela**. Then Walley (1928) and Miss Doering (1941) quote Ball's conclusions and indicate agreement with them. However, Say's records were made at a time when "Missouri" meant most of the Louisiana Purchase Territory, so too much reliance can not always be placed on them. Therefore, in the absence of specimens and because all other records indicate these to be more northern species, I believe it would be better to drop these names from our list than to hypothesize further.

In 1831 Say described **"Aphrophora bilineata"** and wrote "It inhabits Missouri." Goding (1895) placed this as a synonym of **Philaenus lineatus** Linn. and used Say's locality for that species. Later students have found these two to be distinct, not synonymous, and to have ranges which are more northern and western. So they probably do not occur in Missouri. Here too, then, Say's "Missouri" record is open to the same criticism as stated above under **Aphrophora parallela**. The genus **Philaenus** was said by Miss Doering (1930) to have been collected in Missouri. Except for Goding's above citation, we had no specimen or literature records indicating which species might occur. In reply to a query on this point, Miss Doering informed us that she had no Missouri data other than Goding's 1895 record and had accidently overlooked his transfer of this locality. Therefore, for the sake of greater accuracy, these names should be stricken from our list.

As a result of this little study our list now contains eleven species in four genera.

Through the kindness of Dr. L. Haseman I was able to review the material in the collection of the University of Missouri.

All records not directly attributable to the author are initialed to show collector, as in the following list: C. W. Wingo, E. H. Froeschner, P. H. Johnson and W. W. Smith.

The illustrations are all the original work of my wife, Elsie Herbold Froeschner.

Keys to the Missouri Subfamilies, Genera and Species of the Family Cercopidae

1. Anterior margin of pronotum straight; eyes rounded . . . . Ceropinae . . . . I. **Tomaspis**
   Anterior margin of pronotum rounded or angulate medially; eyes frequently elongate . . . . Aphrophorinae 2
2. (1). Clavus with apex acute; hemelytra without a differentiated membrane; form elongate (Figs. 2 and 3) 3
   Clavus with apex broadly rounded; hemelytra with a distinct membrane; form globose (Fig. 4) ..... IV. **Clastoptera**
3. (2). Front margin of pronotum angulate medially; vertex and pronotal disk with a distinct, longitudinal, median carina ..... II. **Aphrophora**
   Front margin of pronotum rounded; vertex and pronotal disk without a longitudinal median carina ..... III. **Lepyronia**

I. **Tomaspis** Amyot & Serville

1. Dark chestnut-brown to black; margin and median line of vertex, eyes, ocelli and lateral margins of pronotum red; interhumeral line and two lines transversely trisecting hemelytra red varying to creamy-yellow; length 8-10 mm. ..... 1. **bicincta** (Say) (Fig. 1)

II. **Aphrophora** Germar

1. Head across eyes wider than prothorax; postclypeus not visible from above; grayish-brown to brown with hyaline areas on costal margins; length 7-8 mm. ..... 2. **quadrinotata** (Say) (Fig. 2)

III. **Lepyronia** Amyot & Serville

1. Hemelytra each with spot on base and apex and V-shaped mark on center fuscous; width across combined hemelytra less than half the total length of the insect; length 6-8.5 mm. ..... 3. **quadrangularis** (Say) (Fig. 3)

IV. **Clastoptera** Germar

1. Face with upper portion shining black 2
   Face with upper portion not wholly black 4
2. (1). Entirely black above; face with lower portion bright yellow; pronotum with feeble transverse rugae; length 2.5-3.5 mm. ..... 4. **hyperici** Gib.
   Not entirely black above 3
3. (2). Clavus longitudinally vittate; face with black of upper portion not extending down to its middle; length 4.4-5.2 mm. ..... 5. **salicis** Doer.
   Clavus not longitudinally vittate; face with black of upper portion not extending down to its middle; pronotum with transverse rugae very weak; length 3.5-4.4 mm. ..... 6. **proteus** Fitch

a. Pronotum yellow, occasionally marked with black; hemelytra never marked with black ..... nominal **proteus** Fitch

b. Pronotum black with a transverse yellow band on apical third; hemelytra marked with black ..... variety **nigricollis** Fitch (Fig. 4)

4. (1). Face marked with shining black 5

Face entirely pale; sexes unlike in coloration (see immediately below); length 3.2-4.2 mm. ..... **11. testacea** Fitch

♂ pronotum black with broad, transverse, yellow band on apical third; hemelytra with the broad, hyaline costal border interrupted behind the middle by an extension of the dark brown of the corium.

♀ testaceous, pronotum yellow, sometimes tinged with green; hemelytra never with dark brown.

5. (4). Face yellow with a black band across its middle and a series of paired black arcs above it 6

Face without a median cross band but with lower half black or mottled: length 4.6-5.1 mm. ..... **10. obtusa** Say

a. Clavus with an oblique, white cross-band ..... b

Clavus unicolorous, not banded ..... variety **tristis** Van D.

b. Elytra dark fuscous brown; claval cross-band very distinct ..... variety **borealis** Ball

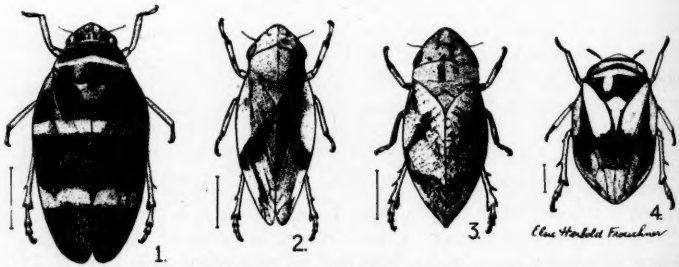
Elytra fuscous, mottled; claval cross-band faint .. nominal **obtusa** Say

6. (5). Clavus unicolorous; costal margin of tegmina with a white spot near middle; length 2.5-3.3 mm. ..... **7. xanthocephala** Germ.

Clavus bicolored 7

7. (6). Pronotum entirely pale; clavus dark brown with anterior part yellow; length 3.5-4.8 mm. ..... **8. achatina** Germ.

Pronotum pale with a distinct pattern of dark brown cross bands; clavus dark brown with oval patch on outer side near base and obliquely transverse band near middle; length 3.4 mm. ..... **9. arborina** Ball



1. Tomaspis bicincta. 2. Aphrophora quadrinotata. 3. Lepyronia quadrangularis. 4. Clastoptera proteus var. nigricollis.

Notes on Missouri Cercopidae

1. **Tomaspis bicincta** (Say). The nominal form only has been found in the Missouri material which has passed through my hands. It probably occurs throughout the state, but it is much more abundant in the southern part where adults are usually found on branches of red-bud, **Cercis canadensis** L. They also come to lights occasionally. Available records indicate imagoes from June 9 to September 3. Barry, Boone, Carter, Howell, Newton and St. Louis counties.

2. **Aphrophora quadrinotata** Say. Adults of this species have been found on various oaks in woods between May 30 and July 23. It seems to be more common in the Ozarks Region of the state. Although all of our specimens agree in such structural characters as having a receding post-clypeus, the head wider than the prothorax, the latter with parallel sides and the males with like genital plates, two of the many at hand differ greatly in color from the usual form. They are strongly suffused with dark brown, more so laterally. This obliterates all the pale costal markings, except the anterior spot which here is yellowish-hyaline and so not very distinct. In the usual form there is frequently a darkening of the ground color, but this does not appear to encroach on the pale lateral markings. Instead it accentuates them by the greater contrast. The two odd specimens were both collected at the same locality, but the second one was taken four years later than the first. This seems to indicate that the form may be established in that particular locality. To my mind, then, this appears to be a distinct color variety which may be known as—

Aphrophora quadrinotata variety **obliterata** new variety. Similar in structural details to nominal form, including the genital plate of the male which has the square emargination in the middle of the posterior margin. It differs only in color, being strongly suffused with dark brown so as to obliterate all of the hyaline areas of the costal region except the premedian one which here is yellow-hyaline and therefore not so distinct. Holotype male: Big Spring State Park, Van Buren, Missouri, June 8, 1944 (R. C. Froeschner), on **Ceanothus.**

Allotype female: same locality as holotype, June 30, 1940 (R. C. Froeschner), on **Pinus echinata.**

It is of particular interest to note that both specimens came from plants other than the usual oaks. At present I have no explanation for this other than these may just be "sitting" records.

Specimens of the regular or nominal form have been collected in Barry, Carter, Iron, Jefferson (EHF), McDonald, Saline, St. Louis, Schuyler and Shannon counties.

3. **Lepyronia quadrangularis** (Say). This very common species was originally described (1825) in the genus **Cercopis** with the remarks, "Inhabits Missouri." Adults have been found the year around, hibernating in grass clumps, under fallen logs and among leaves and other debris on the ground. In early spring they are to be found in great numbers on the wild gooseberries,

Ribes, which plant is one of the first to put out its leaves. Later they fly to many other plants and may be collected from fields or woods. Our records for nymphs show them in their characteristic spittle-masses from late May until early July. Miss Doering (1922) lists it for "Atherton, Mo." which is in Jackson County. Barry, Boone, Buchanan, Butler, Cape Girardeau (CWW), Cass (EHF), Clark, Cole, Howell, Jackson, Jasper, Jefferson (EHF), Lafayette, Lawrence (WWS), McDonald, Mississippi, Morgan, Newton, Pemiscot, Perry, Pike, Pulaski (EHF), Ste. Genevieve, St. Louis, Saline, Shannon, Stoddard, Taney, Texas and Vernon counties.

4. **Clastoptera hyperici** Gib. The only available Missouri record is a specimen collected on June 19, 1930 at Columbia (Boone County) (PHJ).

5. **Clastoptera salicis** Doer. Specimens from "Missouri" are listed (1928) among the paratypes of this species. We have a single specimen collected in Mississippi County on August 11.

6. **Clastoptera proteus** Fitch. Both varieties of this species are recorded for "Missouri" by Miss Doering (1928) and should occur throughout the state. A single specimen of the nominal form was taken from the Japanese beetle traps in St. Louis on July 23. The color form **nigricollis** Fitch is apparently more common in the state, twelve specimens being at hand. Of these, five were taken while they had their beaks inserted in the leaves and branches of a mulberry tree, one was found in a Japanese beetle trap and the rest were collected in general sweeping. Extremes of dates are June 16 and July 23. Carter, Jackson and St. Louis counties.

7. **Clastoptera xanthocephala** Germ. This is probably the commonest Cercopid in the state. The two color forms which are separated only on intensity of the dark color are too difficult to separate because of the numerous intergrading individuals. Therefore, I am combining all records under this one heading. It is taken most frequently from sunflower plants, **Helianthus** spp., but is also met with in some numbers in general sweeping in woods and fields. May 4 to October 13 represents the period during which adults have been collected. Barry, Boone, Butler, Crawford, Dent, Dunklin, Howell, Madison, Mississippi, Morgan, New Madrid (EHF), Newton, Osage (EHF), Ozark, Pemiscot, Perry, Pike, Pulaski, Ste. Genevieve (EHF), St. Charles, St. Louis, Scott, Shannon, Stoddard, Taney, Vernon and Wayne counties.

8. **Clastoptera achatina** Germ. The only definite record for the state is that of Miss Doering (1928). General distribution indicates that it should be state-wide in occurrence.

9. **Clastoptera arborina** Ball. A lone specimen was swept from red cedar, **Juniperus virginiana** L., in Jefferson County on August 9.

10. **Clastoptera obtusa** Say. A pair of the nominal form was collected in Mississippi County on August 8. The variety **tristis** VanD. was listed for the state by Ball (1927). The variety **borealis** Ball has been listed for Iowa and Kansas so it, too, may occur in Missouri.

11. **Clastoptera testacea** Fitch. Most of our specimens have been swept from yellow pine, **Pinus echinata** Mill., in the southern part of the state

during June. A copulating pair was found on the 29th of that month. A single specimen was collected from the same host on October 15. Carter, Iron, McDonald (EHF) and Shannon counties.

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Although all the literature listed here contain mention of Missouri material (some erroneously), Miss Doering's 1930 "Synopsis" has proved most useful in identifying local specimens.

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